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NASA TECH BRIEF

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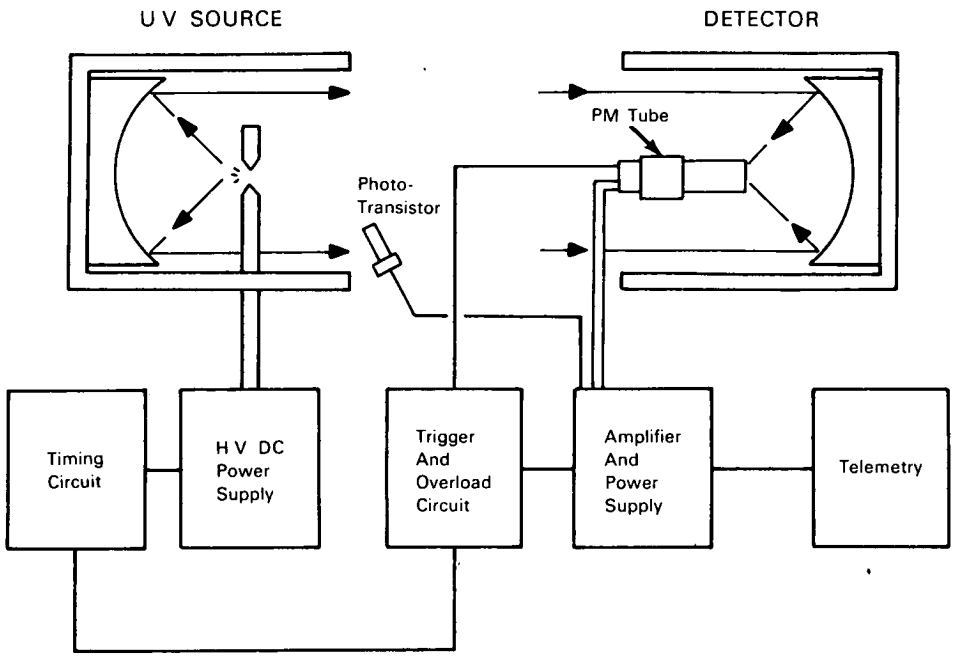
Instrument Accurately Measures Extremely Low Air Densities



The problem: Devising an instrument that will accurately measure air densities ranging from 5×10^{-8} g/cm^3 to 10^{-14} g/cm^3 in high-vacuum systems. One type of densimeter which is used for measuring the density of highly attenuated air depends on the detection of an ultraviolet beam reflected from the air molecules. Since the ultraviolet light transmitted by this type of instrument has the same wavelength as the detected light, reflections from dust, ice, or other particles present in the air can cause large measurement errors.

The solution: An instrument that depends on the detection of near-visible light radiated from nitrogen molecules (present in the high-vacuum system) excited into fluorescence by ultraviolet light (500 to 700 angstroms) from a spark source.

How it's done: A collimated beam of ultraviolet light from the spark discharge is transmitted through the space occupied by the gas molecules towards a detector system consisting of a convergent mirror and a photomultiplier tube. The near-visible light from the fluorescent nitrogen molecules is converted into an electrical signal by the photomultiplier. The output signal from an amplifier provides a measure of the gas density. The system incorporates a phototransistor to monitor the intensity and timing of the spark discharge and also a filter and source modulation system (not illustrated) to exclude ultraviolet radiation reflected from the gas molecules and extraneous particles.

(continued overleaf)

Note: Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama, 35812
Reference: B65-10221

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: Electro-Optical Systems
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